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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF

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SERIAL NO: 10/564,061

FILED: JANUARY 10, 2006 : GROUP ART UNIT: 1793

FOR: METHOD FOR PRODUCING HIGH : CLEANNESS STEEL EXCELLENT IN FATIGUE STRENGTH OR COLD WORKABILITY

PRE-APPEAL BRIEF REQUEST FOR REVIEW

COMMISSIONER FOR PATENTS ALEXANDRIA, VIRGINIA 22313

SIR:

Claims 1-21 are pending in this application. Claim 8 is independent. Claims 1-7 are withdrawn from consideration pursuant to a restriction requirement.

The present invention is directed to high-cleanliness steel having high fatigue strength and high cold workability. This is achieved by controlling the total-Li content of the steel to a specified range, by, e.g., adding a Li-containing substance (such as Si-Li alloy or Li_2CO_3) to molten steel, in order to limit the number of oxide inclusion particles having a major diameter of 20 μ m or above in the steel. Specification at [0001], [0012], [0018], [0021].

Claims 8-21 are rejected under 35 U.S.C. 103(a) over JP63-140068 ("JP-068") in view of JP2002-167647 ("JP-647"), JP2002-194497 ("JP-497") and JP2003-027184 ("JP-184").

JP-068 fails to suggest the independent Claim 8 limitation of a "steel having a total-Li content between 0.020 and 9 ppm by mass". The Final Rejection at page 3, lines 19-20,

admits that "JP '068 does not teach the presence of lithium or limiting inclusions to less than 20 μ m using a 50 gram sample." (Emphasis added).

The Final Rejection relies on <u>JP-647</u> for suggesting these features. The Final Rejection asserts:

While JP '647 does not specifically provide the end Li concentration in the steel in ppm, one would reasonable expect a concentration overlapping the claimed range as the inclusion Li₂O content is in the range claimed in dependent claims 10 and 13. Final Rejection at page 5, lines 19-21 (emphasis added).

The technical reasoning used to assert that the prior art has the claimed Li content is the a function of the lithium content bound in the inclusions. The amount of inclusions can be determined by one of ordinary skill in the art based on analysis of the prior art processing methods. Thus while JP '647 does not specifically provide the end Li concentration in the steel in ppm, one would reasonable expect a concentration overlapping the claimed range as the inclusion Li₂O content is in the range claimed in dependent claims 10 and 13. Final Rejection at page 8, lines 16-22 (emphasis added).

Based on the dependencies of Claims 10 and 13 from independent Claim 8, the "oxide inclusion particles" featured in Claims 10 and 13 are "oxide inclusion particles having a major diameter of 20 μ m or above".

<u>JP-647</u> discloses a steel containing inclusions containing 0.5 to 10% R₂O, where R is Na, K and Li. English-language machine translation of <u>JP-647</u> at page 1. <u>JP-647</u> is directed towards decreasing the maximum width (size) of inclusions to below 10 μ m by increasing the amount of SiO₂ in inclusions from 42 to 75 mass%, or by increasing the amount of R₂O (R is Na, K Li) in inclusions from 0.2 to 9.7 mass%. English-language machine translation of <u>JP-647</u> at [0023]; Drawings 6-7.

However, <u>JP-647</u> is silent about inclusions with diameters of 20 μ m or above.

Contrary to the Final Rejection, <u>JP-647</u>'s inclusion Li₂O content in the range claimed in Claims 10 and 13 would **NOT** reasonably lead the skilled artisan to expect a concentration of Li in steel to overlap independent Claim 1's "total-Li content between 0.020 and 9 ppm", at

least because <u>JP-647</u> does not suggest inclusion particles that feature both (i) the inclusion Li_2O content of Claims 10 and 13 and (ii) the "major diameter of 20 μ m or above" of the "oxide inclusion particles" of Claims 10 and 13.

Thus, the Final Rejection fails to provide any technical basis for the Final Rejection's apparent assertion that a concentration of Li₂O in a metal oxide inclusion in a steel suggests a concentration of Li in the steel. MPEP §§ 2144.02 and 2144.03.

While <u>JP-647</u> discloses a concentration of R₂O (R is Na, K and Li) **in inclusions**, and discloses the frequency distribution of the width of inclusions (i.e., % of inclusions having each inclusion width), <u>JP-647</u> is silent about the concentration of the inclusions **in the steel**. Without knowing the concentration of inclusions containing Li₂O in steel, the skilled artisan cannot calculate the concentration of Li in the steel from a knowledge of the concentration of Li₂O in the inclusions. To calculate the concentration of Li in steel from the concentration of Li₂O in inclusions, the skilled artisan must be provided with the concentration of inclusions in the steel, a concentration that <u>JP-647</u> fails to suggest.

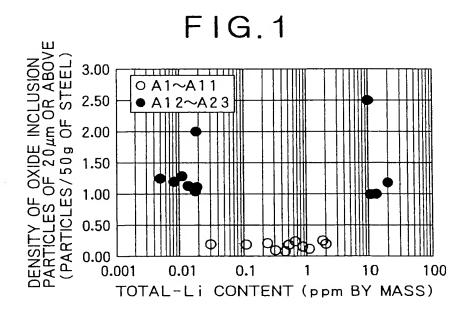
Because <u>JP-647</u> fails to suggest a concentration of inclusions in the steel, <u>JP-647</u>'s disclosure of a concentration of R₂O (R is Na, K and Li) in inclusions in the steel is not sufficient to suggest a total-Li content of the steel.

Thus, <u>JP-647</u> fails to suggest the independent Claim 8 limitation of a "steel having a total-Li content between 0.020 and 9 ppm by mass".

The present inventors have discovered that when the total-Li content in the steel is limited to the range of 0.020 to 9 ppm by mass, the density of oxide inclusion particles of 20 μ m or above is significantly reduced (see specification at Fig. 1), which provides improved cold workability and fatigue characteristics.

Because the cited prior art fails to suggest the independent Claim 8 limitation of a "steel having a total-Li content between 0.020 and 9 ppm by mass", the claims are not *prima* facie obvious.

Any prima facie case of obviousness based on the cited prior art is rebutted by the significant reduction in density of oxide inclusion particles of 20 μ m or above (particles/50g of steel) that is achieved by the present invention over the independent Claim 8 range of "a total-Li content between 0.020 and 9 ppm by mass" and over the Claim 21 range of "a total-Li content between 0.020 and 6 ppm by mass". This is demonstrated in the specification at Fig. 1 (reproduced below).



The data used to prepare Fig. 1 is found in the Declaration Under 37 CFR 1.132 filed September 26, 2008, at Table 1.

The Final Rejection asserts:

In Fig. 1 there is no comparison of the closest prior art to establish superiority in harmful inclusion content. Final Rejection at page 9, lines 15-16.

However, the closest prior art is <u>JP-068</u>, the primary reference.

As discussed above, the Final Rejection at page 3, lines 19-20, admits that "JP '068 does not teach the presence of lithium".

Because the closest prior art of <u>JP-068</u> does not contain Li, data for <u>JP-068</u> (0 ppm Li) would not appear on Fig. 1 (where the total-Li content ranges from 0.001 to 100 ppm).

Furthermore, because <u>JP-068</u> does not contain Li, no comparative data showing how <u>JP-068</u> varies with Li can be plotted on Fig. 1.

Thus, in Fig. 1 no comparison with the closest prior art, <u>JP-068</u>, is possible.

Thus, the superior effect achieved by the present invention with independent Claim 8's "steel having a total-Li content between 0.020 and 9 ppm by mass" is established over the closest prior art.

The cited prior art is silent about the significant reduction in density of oxide inclusion particles of 20 μ m or above (particles/50g of steel) that is achieved by the present invention over the independent Claim 8 range of "a total-Li content between 0.020 and 9 ppm by mass" and over the Claim 21 range of "a total-Li content between 0.020 and 6 ppm by mass". The reduction in density of these oxide inclusion particles of 20 μ m or above over these ranges of total-Li content provides the steel with improved cold workability and fatigue characteristics. There is no recognition in the cited prior art that controlling the total-Li content of steel controls the number of large oxide inclusion particles of diameter 20 μ m or above.

Thus, any prima facie case of obviousness based on the cited prior art is rebutted.

Respectfully submitted,

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